

## DECISION DOCUMENT

For the Disposition of Contaminated  
Metal Debris, Concrete Debris, and Coral  
Located in the Radiological Control Area  
On Johnston Island, Johnston Atoll

### 1. PURPOSE

This decision document describes the selected remedial action for the disposition of plutonium oxide-contaminated metal, concrete, and coral on Johnston Island, Johnston Atoll. This action has been selected in accordance with the Defense Environmental Restoration Program, a program formally established by statute that provides for the cleanup of hazardous substances associated with past Department of Defense activities consistent with the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986, and as implemented by the National Oil and Hazardous Substances Pollution Contingency Plan. This document is intended to comply with the National Environmental Policy Act of 1969.

Johnston Island is part of Johnston Atoll, located about 1,328 km west-southwest of Oahu, Hawaii. During U.S. atmospheric nuclear testing in 1962, aborted missile launches resulted in radioactive contamination on Johnston Atoll. The Defense Threat Reduction Agency (DTRA) legacy organizations began cleanup of the atoll immediately. Since then the agency repeatedly surveyed, reduced the contamination by using available and specially developed technologies, and removed some material off-island for disposal. In September 2000, the U.S. Environmental Protection Agency recommended that the cleanup standard for the atoll be 13.5 picocuries per gram (pCi/g) of coral soil. Except for some material in the fenced, 24-acre Radiological Control Area on Johnston Island, Johnston Atoll's surfaces and buildings meet this cleanup standard.

Contaminated metal debris, concrete debris and coral soil above the cleanup standard are located in three piles in the Radiological Control Area. Plutonium and americium, a decay product of plutonium, oxides are the contaminants of concern. A 240-ton pile of metal and a 200-cubic-meter pile of concrete debris have been surveyed sufficiently to determine that most of the material is radioactively contaminated. The contaminated coral pile, the "above" pile, is approximately 45,000 cubic meters and has an average radioactivity concentration of 200 pCi/g. The "above" pile is the result of coral separation and volume reduction during several clean-up efforts at Johnston Atoll. The separation efforts isolated the contamination and created two piles, one above and the other below the cleanup standard. The other coral pile, the "below" pile (below the cleanup standard), is approximately 120,000 cubic meters and has an average radioactivity concentration of 7.7 pCi/g. DTRA proposes to place the contaminated debris and the coral above 13.5 pCi/g in a covered landfill to limit human exposure and further release to the environment.

# DECISION DOCUMENT For the Disposition of Metal Debris, Concrete Debris, and Radioactive Coral on Johnston Island, Johnston Atoll

This remedial action option was selected by DTRA with input from the U.S. Air Force, U.S. Army, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service and general public.

## 2. SITE RISK

Plutonium's chemical and physical properties limit the radiological risk to humans and migration in the Johnston Atoll environment. Plutonium radionuclides are primarily alpha emitters and therefore are essentially an ingestion or inhalation hazard. The plutonium isotopes of interest are  $^{238}\text{Pu}$ ,  $^{239}\text{Pu}$ ,  $^{240}\text{Pu}$  and  $^{242}\text{Pu}$ . Americium's chemical and physical properties also limit the radiological risk to humans and migration in the Johnston Atoll environment. The americium radionuclide,  $^{241}\text{Am}$ , is primarily an alpha emitter; therefore, predominantly an ingestion or inhalation hazard also.

Air sampling shows the radionuclide air-concentrations are below the recommended limits for general public exposure unless extensive earth-moving activity is occurring on the "above" pile. Winds and the low-level activity on the island do not produce a significant risk of airborne plutonium oxide.

Groundwater investigations in 1999 concluded that *in-situ* groundwater concentrations (at the area of maximum potential contamination) were 1% of the Federal drinking water standard for alpha-emitting radionuclides. When local groundwater was forced through a column of contaminated soil, there was no statistically significant difference in the plutonium/americium concentrations of the influent and effluent. Plutonium oxide at Johnston Atoll does not go into solution significantly. There is also no evidence to show plutonium oxide is moving in the Johnston Island soil.

Biota sampling, analysis and risk assessments showed there is no known species at risk from radioactive contamination at Johnston Atoll. The dose calculations predict species receive less than the recommended radiological dose limits. An analysis of consumption of plutonium-contaminated fish at Johnston Atoll estimates the risk to humans is similar to current radiation risks from commercially available seafood and the resulting exposure is below the public radiation exposure limits.

## 3. REMEDIAL ALTERNATIVES

A. The corrective measures study/feasibility study (CMS/FS) remedial alternatives for the contaminated debris were:

Option 1: Scrap Metal Dealer and Island Riprap or Reef Building for the Concrete  
This option has two separate parts. First, a scrap metal dealer would be asked to take the metal debris for recycling. Second, the concrete would be used on Johnston Atoll as riprap. The concrete pile would be broken into more manageable pieces. The concrete would be radiologically surveyed for release at  $168 \text{ pCi/cm}^2$  (fixed) (equivalent to  $13.5 \text{ pCi/g}$ ). The concrete that passed the survey would then be taken outside the Radiological Control Area and used to reinforce the existing seawalls on Johnston Island or for artificial reef building if a U.S. Army Corps of Engineers permit can be obtained. Any concrete that failed the survey or any concrete

DECISION DOCUMENT For the Disposition of Metal Debris, Concrete Debris, and Radioactive Coral on Johnston Island, Johnston Atoll

that was unable to be reduced to a manageable size would remain inside the Radiological Control Area for action under other options.

Option 2: Shipment to an Off-Island Radioactive Waste Facility

This option would require either or both the metal and concrete debris to be dismantled into small enough pieces for transport to a disposal site in the continental U.S. Potential sites are the Envirocare facility in Utah and the U.S. Department of Energy's Nevada Test Site in Nevada. The debris would be shipped from Johnston Island via Hawaii to a major port on the west coast of the continental U.S. and transported from there to the facility.

Option 3: Landfill on Johnston Atoll

The option would move the metal and concrete debris from their present locations to a constructed landfill in the existing excavation hole in the Radiological Control Area. This option would not require a radiological survey since the debris piles would not leave the Radiological Control Area. The metal and concrete would then be covered with coral from the “below” pile. The covering material would be brought into the landfill cells in lifts, compacted, and graded to achieve a 10:1 slope to allow for proper water drainage, prevent any surface ponding, and minimize water intrusion (construction-and-demolition type landfill).

Option 4: No Action

This option would leave the debris piles as they are.

B. The CMS/FS remedial alternatives for the contaminated coral were:

Option 1: Clean Cap

Containment of the entire “above” pile by constructing a landfill in the existing excavation hole in the Radiological Control Area. The coral would be brought in lifts, wetted down, and then compacted to minimize void spaces and to speed the natural “cementing together” of the coral. A 61-cm (two-foot) (minimum) thick clean cap would be placed on the top using the coral from the “below” pile. The covering material would be brought into the landfill in lifts, compacted, and graded to achieve a maximum 10:1 slope to allow for proper water drainage, prevent any surface ponding, and minimize water intrusion (construction-and-demolition type landfill).

Option 2: Geotextile Liner and Clean Cap

Containment of the entire “above” pile by constructing a landfill per option 1. A geotextile liner (a processed membrane material used to avoid water/humidity penetration) would be placed on top of the “above” material and below the clean cap (construction-and-demolition type landfill).

Option 3: Concrete Cap and Clean Cap

Containment of the entire “above” pile by constructing a landfill per option 1. An impermeable concrete cap (3,000 pounds per square inch (psi) concrete at 20 cm (8 inches) thick) would separate the “above” pile from the clean cap on top (construction-and-demolition type landfill).

Option 4: Concrete Vault

Containment of the contaminated pile by constructing a 6-sided concrete vault landfill in the existing excavation in the Radiological Control Area. A 61-cm (two-foot) (minimum) thick clean

## DECISION DOCUMENT For the Disposition of Metal Debris, Concrete Debris, and Radioactive Coral on Johnston Island, Johnston Atoll

cap would be placed on the top of the concrete using the coral from the “below” pile. The covering material would be brought in lifts, compacted, and graded to achieve a maximum 10:1 slope to allow for proper water drainage, prevent any surface ponding, and minimize water intrusion (construction-and-demolition type landfill).

### Option 5: Slurry Mix and Clean Cap

Containment of the entire “above” pile by constructing a landfill per option 1. Before adding the “above” pile coral, a slurry mix combining imported cement and the “above” pile would be made (construction-and-demolition type landfill).

### Option 6: Vitrifying the "Above" Pile

Containment of the entire “above” pile by constructing a landfill in the existing excavation per option 1. Before adding the “above” pile, it would be processed into a vitrified mixture (construction-and-demolition type landfill). (NOTE: Vitrification is the process whereby material is encased inside a molten glass matrix.)

### Option 7: No Action

Leave the entire “above” pile as it is and take no further action

### Option 8: Shipment Off-Island

Shipment of the entire “above” pile to an authorized radioactive waste disposal facility in the continental U.S. Potential sites are the Envirocare facility, Utah and the Nevada Test Site. The pile would be shipped from Johnston Atoll via Hawaii to a major port on the west coast of the continental U.S., then transported to the final disposal site.

The options summarized here are described in the CMS/FS report dated 13 June 2002 which contains a more detailed description of all the options and selection process.

## 4. PUBLIC/COMMUNITY INVOLVEMENT

DTRA involved the local community throughout the environmental restoration process. Unlike most military installations, which have local communities adjacent to the installation, the nearest community to Johnston Atoll is 1,328 km away, in Hawaii. Therefore, DTRA held public meetings and informal public availability sessions on the four major islands of Hawaii: Oahu, Kauai, Maui, and the Island of Hawaii. These meetings informed the public about the project’s risk assessment and clean up level (July 2000), solicited alternatives for the disposition of the contaminated material (May 2001), and solicited comments on the CMS/FS (March 2002). Responses to the comments during the public comment period in 2002 are attached.

## 5. DECLARATION

The selected remedy (a combination of option 3 for the debris and option 1 for the coral) is protective of human health and the environment, attains Federal requirements that are applicable or relevant and appropriate to this remedial action and is cost effective. This remedy utilizes permanent solutions and recovery to the maximum extent practicable for this site. However, because treatment of radiological material is not possible, this remedy does not satisfy CERCLA’s statutory preference for treatment as a principal element of the remedy.

DECISION DOCUMENT For the Disposition of Metal Debris, Concrete Debris, and Radioactive Coral on Johnston Island, Johnston Atoll

6. LONG-TERM MONITORING REQUIREMENTS

After site remediation, at a minimum, DTRA will monitor the landfill site for construction faults for five years or until routine, scheduled, normal airline service to Johnston Atoll is terminated, whichever is first. The 5-year monitoring period will allow time for any construction failures to occur. During the 5-year monitoring period, an annual report will be prepared and provided to the island custodian. Permanent markers will be placed at the corners of the landfill, and the precise location of the landfill will be provided to the U.S. Fish and Wildlife Service (the projected custodians of the island) or to the appropriate island custodian. A deed restriction (or similar document) to prohibit digging inside the area bounded by the permanent markers will help protect against human intrusion. If any radiological contamination is found after landfill monitoring is completed, the contamination will be evaluated by the DTRA health physics staff and appropriate action taken. No other radiological monitoring or land use restrictions are necessary for Johnston Atoll. Any additional sampling and long term monitoring will be set forth in a memorandum of agreement with the U.S. Fish and Wildlife Service and coordinated with other appropriate agencies, including the U.S. Environmental Protection Agency.

7. APPROVAL AND SIGNATURE

The selected option for the Johnston Island site is a landfill for the metal debris, the concrete debris and the radioactive coral above 13.5 pCi/g and limited institutional controls. The total cost of this action is estimated at \$2 million. The appropriate approval authority for this action is the DTRA director.

APPROVED BY:

---

STEPHEN YOUNGER  
Director

Attachment  
Responsiveness Summary